UP 10: Poster: Umweltphysik

Zeit: Donnerstag 17:48–19:00 Raum: VMP 9 Poster

UP 10.1 Do 17:48 VMP 9 Poster

HOx radical measurements in the lower troposphere using an airborne laser-induced fluorescence instrument on a Zeppelin NT — •Andreas Oebel, Sebastian Broch, Dominik Raak, Birger Bohn, Franz Rohrer, Frank Holland, Andreas Hofzumahaus, and Andreas Wahner — Forschungszentrum Juelich, Institute for Chemistry and Dynamics of the Geosphere ICG-2: Troposphere, Germany

The radical chemistry of the lower troposphere was investigated during the ZEPTER-2 field campaign at Lake Constance in October/November 2008, using the unique capabilities of a modified Zeppelin NT as an airborne measurement platform. The Zeppelin was equipped with in-situ instruments for measurement of OH and HO2 radicals, the main radical precursors (O3, HONO, HCHO), photolysis frequencies, and prime reactants (NOx, CO, VOCs) of OH. The instrumentation has been used to chemically characterize the planetary boundary layer and the lower free troposphere. Vertical profiles of the trace gases were observed at altitudes up to 1000m above different land surfaces, including Lake Constace, the city of Ravensburg and forests. In this presentation technical details of the measurement platform Zeppelin NT will be presented as well as first results of the HOx radical measurements.

UP 10.2 Do 17:48 VMP 9 Poster

Barotropic and baroclinic processes in the transport variability of the Antarctic Circumpolar Current — •Karsten Lettmann[1] and Dirk Olbers[2] — [1]ICBM, University of Oldenburg, Germany — [2]AWI, Bremerhaven, Germany

Variability of the Southern Ocean wind field result in transport variations of the Antarctic Circumpolar Current (ACC). It is observed that these transport fluctuations are highly coherent with the bottom pressure field all around the Antarctic continent in the high-frequency range. The coherence pattern, in contrast to the steady state ACC, is steered by the geostrophic f/h contours passing through Drake Passage and circling closely around the continent. At lower frequencies, with interannual and decadal periods, the correlation with the bottom pressure continues but baroclinic processes gain importance.

To clarify the dynamic processes we apply a circulation model with simplified physics (the BARBI model) and use two types of wind forcing: NCEP wind fields spanning three decades, and an artificial wind field constructed from the first three EOFs of NCEP wind field. We analyze trends and variability of the model runs. Particular emphasis is placed on coherence and correlation patters between the ACC transport, the wind forcing, the bottom pressure field and the pressure associated with the baroclinic potential energy. A simple stochastic dynamical model is developed which describes the dominant barotropic and baroclinic processes and represents the spectral properties for a wide range of frequencies, from monthly periods to hundreds of years.

UP 10.3 Do 17:48 VMP 9 Poster

Concentrated atmospheric nanoparticle beams in vacuum for X-ray and optical spectroscopy. — •Jan Meinen[1,2], Svetlana Khasminskaya[1], and Thomas Leisner[1,2] — [1]Institute for Meteorology and Climate Research, Aerosols and Heterogeneous Chemistry in the Atmosphere (IMK-AAF), Forschungszentrum Karlsruhe GmbH, Germany — [2]Institut for Environmental Physics (IUP), Atmosphere and Remote Sensing, Ruprecht-Karls-Universität Heidelberg, Germany

The IPCC AR4 points out the important role of aerosol in the radiation budget of the earth. In the model prediction, direct and indirect contribution of the atmospheric aerosol causes a net cooling of the earth. Understanding the fundamental physical and chemical processes of heterogeneous nucleation of water on nanoparticles could help improving the models.

Here we present the first stage of the TRAPS apparatus (Trapped Reactive Atmospheric Particle Spectrometer) consists of a nanoparticle source, an aerodynamic lens and differential pumping system, a linear ion trap with driving electronics and particle detectors. This assembly is capable to inject nanoparticles into vacuum chambers in a highly efficient way. The dilution of the particle number concentration arising from the gas expansion from room pressure into vacuum is compensated by concentrating the particles in a small cylindrical volume by electrodynamic trapping. The enlargement of the target density compared to a free molecular beam provides a tool for various techniques of spectroscopy used on smaller ions by routine.

UP 10.4 Do 17:48 VMP 9 Poster

Cavity Enhanced DOAS - Instrument design and theory — •Jan Meinen[1,2], Jim Thieser[3], Denis Pöhler[2], Ulrich Platt[2], and Thomas Leisner[1,2] — [1]Institute for Meteorology and Climate Research, Aerosols and Heterogeneous Chemistry in the Atmosphere (IMK-AAF), Forschungszentrum Karlsruhe GmbH, Germany — [2]Institut for Environmental Physics (IUP), Atmosphere and Remote Sensing, Ruprecht-Karls-Universität Heidelberg, Germany — [3]Max-Planck-Institut für Chemie, Division of Atmospheric Chemistry, Mainz, Germany

Cavity enhanced methods in absorption spectroscopy have seen a considerable increase in popularity during the past decade. Especially Cavity Enhanced Absorption Spectroscopy (CEAS) established itself in atmospheric trace gas detection by providing tens of kilometers of effective light path length using a cavity as short as 1 m. This device combines the small size of the cavity with the enormous advantages of the DOAS approach in terms of sensitivity and specificity, and lends itself to the application of the DOAS technique to analyse the derived absorption spectra. While the Cavity Enhanced-DOAS approach has enormous advantages in terms of sensitivity and specificity of the measurement, an important implication is the reduction of the light path by the trace gas absorption, since cavity losses due to absorption by gases reduce the quality of the cavity. We show the basic concept of a Cavity Enhanced-DOAS instrument, discuss the relationships caused by the light path reduction and present methods to correct the obtained trace gas concentrations.

UP 10.5 Do 17:48 VMP 9 Poster

Satellite validation of column-averaged methane on global scale: Harmonized data from 13 FTIR ground stations versus last generation ENVISAT/SCIAMACHY retrievals — R. Sussmann, •F. Forster, T. Borsdorff, and FTIR validation team — Research Center Karlsruhe, IMK-IFU, Garmisch-P.

Global measurements of column-averaged methane have recently shown a step forward in data quality via year 2003 and 2004 retrievals from two different processors (Frankenberg et al., 2008; Buchwitz et al., 2008). Accuracy and precision have approached the order of 1 %, and can be considered for inverse modelling of sources and sinks. This means that quality requirements for ground-based validation data have become higher. In order to guarantee a consistency of <1 % we performed a harmonization effort for 13 globally distributed mid-infrared FTIR stations. Station-to-station biases are eliminated by using identical micro-windows, spectroscopic line lists, retrieval parameters, sources of ancillary data like pressure-temperature profiles, and water vapor data for deriving dry air columns. Furthermore, a geophysically consistent set of prior information for the retrievals at all stations was established. Our study utilizes the validation strategy developed during the first validation of ENVISAT/SCIAMACHY column-averaged methane by FTIR (Sussmann et al., 2005). The outcome of the new study is the accurate determination of the satellite-ground station biases as a function of latitude on global scale, as well as an assessment of the ability of ENVISAT/SCIAMACHY to measure true day-to-day variability.

UP 10.6 Do 17:48 VMP 9 Poster

High-precision measurements of column-averaged CO2 and CH4 derived from near-infrared FTS at the TCCON site Garmisch (47 °N, 11 °E, 744 m asl.): First year of operation and contribution to OCO validation — R. Sussmann, M. Rettinger, •T. Borsdorff, and F. Forster — Research Center Karlsruhe, IMK-IFU, Garmisch-Partenkirchen (Germany)

Since 2007 at Garmisch, Germany (47.48 °N, 11.06 °E, 744m a.s.l.) a Bruker IFS125HR near-infrared Fourier-Transform-Spectrometer is operated as part of the Total Carbon Column Observing Network (TCCON; http://www.tccon.caltech.edu). Solar absorption spectra in the wave number range 4000 - 16 000 cm-1 are recorded continuously during clear sky conditions using dual acquisition from an InGaAs detector and a Si diode. From these spectra, accurate and precise